

Dr. W. H. Thorpe, Cambridge University, reviewing the extraordinary experiments of Prof. K. von Frisch on the honey-bee's ability to orientate itself, suggested that the pull of gravity is presumably perceived by the proprioceptive sense organs at the limb and abdominal articulations.

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INTER-SPECIFIC COMPETITION ON SMALL ISLANDS

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A characteristic of the distribution of some members of the native fauna on the islands around the Western Australian coast is that a species of a closely related group may be found on one island and another species on another. But the two do not exist together on the one island, though all of the species concerned occur on the mainland in the same general geographical area. The facts are best known in the case of the marsupials and the reptiles.

The Quokka (*Setonix brachyurus*) is found on Rottnest Island and Bald Island on the south coast. The Tammar (*Macropus eugenii*) occurs on East and West Wallaby Islands in the Abrolhos, on Garden Island and on certain of the islands of the Archipelago of the Recherche (North Twin Peaks and Middle Islands). The Rock Wallaby (*Petrogale lateralis hacketti*) inhabits Mondrain, Combe and Salisbury Islands in the Recherche.

Among the snakes the Carpet Snake (*Morelia variegata*) is found on the Wallaby Islands and on Garden Island. The Dugite (*Demansia nuchalis*) is found on Rottnest Island and the Tiger Snake (*Notechis scutatus*) on Carnac and Garden Islands.

All these islands were formerly joined to the mainland and the fauna now represented on them is the survival of that which existed there before the islands were isolated. To account for the present distribution, some ingenious theories have been put forward. J. R. Clarke ("Notes on Natural History of the Quokka," *Journ. Roy. Soc. W.A.*, vol. 33, 1948, p. 141) explains the occurrence of the Quokka on Rottnest and of the Tammar on Garden Island by invoking a theory of inter-specific competition which is unacceptable on modern ecological views.

A more reasonable explanation of the distribution phenomena on these islands may be found in the application of what is coming to be known as "Gause's Law," after G. F. Gause (*The Struggle*

for *Existence*, 1934) who experimentally demonstrated a principle long familiar, in effect, among field naturalists that two species with similar ecology cannot co-exist in the same habitat. In a normal mainland environment a diversity of similar animal species can occur, each characteristic of a particular ecological niche or else differing in food preferences. A small island, however, cannot maintain a variety of habitats of sufficient effective area and there must come a point in the reduction of an island, varying for different species, where distinction between ecological niches is no longer a real factor. The formerly non-competing forms are no longer so and Gause's Law comes into operation. Which species survives may depend on fine differences in the reactions of each to the particular insular environment, or perhaps, be entirely fortuitous.

David Laek (*Genetics, Paleontology, and Evolution*, 1949, p. 302) has referred to the subject in his study of the finches of the Galapagos, stating: "The reduction in the number of species and of ecological niches, even in the same general type of habitat, on islands as compared with continents, and on small as compared with large islands, seems widespread in birds, and should be studied further." Ernst Mayr (*Advances in Genetics*, vol. 2, 1948, p. 215) quotes Stresemann in pointing out that "there is some correlation between the number of ecological niches in a given region and the number of sympatric related species that can be accommodated. The poverty of island faunas is partly due to this factor. Species which on mainlands live side by side may be strictly allopatric on islands."

Rottneest Island has an area of 4,726 acres, Garden Island, 2,790 acres and Carnarvon Island, 43 acres. These islands appear to have been reduced to an area which is significant for the limitation of numbers of species of moderately-sized vertebrates. For insects and other invertebrates the critical threshold area may not have been reached.

The bevelling out of effective differences between ecological niches on small islands, and the consequent simplification of the ecological picture, means that only one species of a group with rather similar habits will, in general, survive. The consequent removal of inter-specific competition may result in the single surviving species occupying habitats in which it would not normally be found on the mainland. The removal of brakes to population increases by the elimination of inter-specific competition may also result in the individuals occurring in much greater concentration than is ordinarily found on the mainland. There may be a poverty of species on small islands but often the abundance of individuals is very great. Western Australian examples are striking, namely the Quokka on Rottneest, the lizard *Egernia kingii* on Pelsart and Eclipse Islands, and the Death Adder (*Acanthophis antarcticus*) on some of the Recherche Islands. In Bass Strait some islands, notably Chappell, carry a population of Tiger Snakes which has made them notorious.